

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 Claim 1 (currently amended): A computer-implemented  
2 method comprising:  
3 a) accepting forwarding liveness status information  
4 of at least two different interfaces of a data  
5 forwarding device;  
6 b) composing an aggregated message including at  
7 least two indicators, each indicator identifying a  
8 different one of the at least two different  
9 interfaces and corresponding forwarding liveness  
10 status information of the at least two different  
11 interfaces as data within the aggregated message;  
12 and  
13 c) sending the aggregated message towards a  
14 neighbor node,  
15 wherein the forwarding liveness status  
16 information includes an integrity and correct  
17 operation of a forwarding table used by the data  
18 forwarding device.

1 Claim 2 (previously presented): The computer-implemented  
2 method of claim 1 further comprising:  
3 d) maintaining a first timer for tracking a send  
4 time interval, wherein the acts of composing the  
5 aggregated message and sending the aggregated  
6 message are performed after expiration of the first  
7 timer; and  
8 e) restarting the first timer after the aggregated  
9 message is sent.

1 Claim 3 (previously presented): The computer-implemented  
2 method of claim 2 wherein the aggregated message further  
3 includes a dead time interval, and wherein the send time  
4 interval is less than the dead time interval.

1 Claim 4 (previously presented): The computer-implemented  
2 method of claim 2 wherein the aggregated message further  
3 includes a dead time interval, and wherein the send time  
4 interval is no more than one third of the dead time  
5 interval.

1 Claim 5 (previously presented): The computer-implemented  
2 method of claim 2 wherein the send time interval is less  
3 than one second.

1 Claim 6 (previously presented): The computer-implemented  
2 method of claim 2 wherein the send time interval is less  
3 than 100 msec.

1 Claim 7 (previously presented): The computer-implemented  
2 method of claim 1 wherein the aggregated message further  
3 includes a dead time interval.

1 Claim 8 (previously presented): The computer-implemented  
2 method of claim 1 wherein the act of sending the  
3 aggregated message includes providing the aggregated  
4 message in an Internet protocol packet.

1 Claim 9 (previously presented): The computer-implemented  
2 method of claim 8 wherein the aggregated message is sent  
3 towards the neighbor node by setting a destination  
4 address in the Internet protocol packet to a multicast

5 address associated with routers that support aggregated  
6 interface forwarding liveness.

1 Claim 10 (previously presented): The  
2 computer-implemented method of claim 1 wherein the status  
3 information includes a forwarding liveness state selected  
4 from a group of forwarding liveness states consisting of  
5 (A) interface up, (B) interface down, (C) interface  
6 monitor not reporting, and (D) forwarding engine  
7 restarting.

1 Claim 11 (currently amended): For use with a node, a  
2 computer-implemented method comprising:  
3 a) receiving, using the node, an aggregated message  
4 including  
5 i) at least two indicators, each indicator  
6 identifying a different one of at least two  
7 different interfaces of a neighbor node and  
8 corresponding forwarding liveness status  
9 information for the ~~[[a first set of]]~~ at least  
10 two different interfaces as data within the  
11 aggregated message, and  
12 ii) a time interval; and  
13 b) updating, using the node, neighbor node  
14 forwarding liveness status information using the  
15 aggregated message,  
16 wherein the forwarding liveness status  
17 information includes an integrity and correc:  
18 operation of a forwarding table of the neighbor  
19 node.

1 Claim 12 (currently amended): The computer-implemented  
2 method of claim 11 wherein the act of updating neighbor  
3 node liveness status information includes  
4 i) setting a first timer to the time interval  
5 and starting the first timer,  
6 ii) if the first timer expires, setting a  
7 status of each of the at least two different  
8 interfaces of the neighbor node to down; and  
9 iii) if a further message, sourced from the  
10 neighbor node, and including  
11 A) at least two indicators, each  
12 indicator identifying a different one of  
13 the at least two different interfaces of  
14 the neighbor node and corresponding  
15 forwarding liveness status information,  
16 and  
17 B) a new time interval,  
18 is received then, resetting the first timer to  
19 the new time interval and restarting the first  
20 timer.

1 Claim 13 (previously presented): The  
2 computer-implemented method of claim 12 wherein each of  
3 the time interval and the new time interval is less than  
4 one second.

1 Claim 14 (previously presented): The  
2 computer-implemented method of claim 11 wherein the  
3 forwarding liveness status information is interface  
4 forwarding liveness status information.

1 Claim 15 (previously presented): The  
2 computer-implemented method of claim 11 wherein the  
3 status information includes a forwarding liveness state  
4 selected from a group of forwarding liveness states  
5 consisting of (A) interface up, (B) interface down, (C)  
6 interface monitor not reporting, and (D) forwarding  
7 engine restarting.

1 Claim 16 (currently amended): The computer-implemented  
2 method of claim 11 wherein the forwarding liveness status  
3 information further includes at least one of (i) ~~[[the~~  
4 ~~integrity and correct operation of forwarding tables,~~  
5 ~~(iii)]]~~ the integrity and correct operation of switch  
6 fabric, (ii ~~[[iii]]~~) the integrity and correct operation  
7 of a forwarding lookup engine, (iii ~~[[iv]]~~) the integrity  
8 and correct operation of a traffic scheduler, (iv ~~[[v]]~~)  
9 the integrity and correct operation of a traffic  
10 classifier, (v ~~[[vi]]~~) the integrity and correct  
11 operation of buffers in the data plane, (vi ~~[[vii]]~~) the  
12 integrity and correct operation of packet segmentation  
13 modules, (vii ~~[[viii]]~~) the integrity and correct  
14 operation of packet reassembly modules, (viii ~~[[ix]]~~) the  
15 integrity and correct operation of packet re-sequencing  
16 modules, (ix ~~[[x]]~~) whether or not a node is restarting,  
17 (x ~~[[xi]]~~) whether or not the forwarding plane is  
18 congested, or (xi ~~[[xii]]~~) the integrity and correct  
19 operation of fragmentation modules.

1 Claim 17 (previously presented): The  
2 computer-implemented method of claim 11 wherein the  
3 forwarding liveness status information includes at least

4 one of (i) bit error rate at a link interface, and (ii)  
5 clock synchronization at a link interface.

1 Claim 18 (currently amended): A computer-implemented  
2 method for monitoring interface forwarding liveness, the  
3 method comprising:

4 a) determining, at a first node, forwarding  
5 liveness status information for at least two  
6 different interfaces of the first node;  
7 b) sending, from the first node, an aggregated  
8 message including at least two indicators, each  
9 indicator identifying a different one of at least  
10 two different interfaces and the corresponding  
11 determined status information for the at least two  
12 different interfaces as data within the aggregated  
13 message;  
14 c) receiving, at the second node, the aggregated  
15 message; and  
16 d) updating, by the second node, first node  
17 forwarding liveness status information using the  
18 aggregated message,  
19 wherein the forwarding liveness status  
20 information includes an integrity and correc:  
21 operation of a forwarding table of the first node.

1 Claim 19 (previously presented): The  
2 computer-implemented method of claim 18 wherein the  
3 aggregated message further includes a dead interval, and  
4 wherein the act of updating first node forwarding  
5 liveness status information includes  
6 i) setting a timer to the dead interval;  
7 ii) starting the timer;

8           iii) determining whether or not a further  
 9           message including forwarding liveness status  
 10          information is received from the first node  
 11          before the expiration of the timer; and  
 12          iv) if it is determined that a further message  
 13          including forwarding liveness status  
 14          information is not received from the first node  
 15          by the second node before the expiration of the  
 16          timer, then informing the second node that the  
 17          at least two different interfaces of the first  
 18          node are down.

1   Claim 20 (previously presented): The  
 2   computer-implemented method of claim 18 wherein the  
 3   status information includes a forwarding liveness state  
 4   selected from a group of forwarding liveness states  
 5   consisting of (A) interface up, (B) interface down, (C)  
 6   interface monitor not reporting, and (D) forwarding  
 7   engine restarting.

1   Claim 21 (currently amended): The computer-implemented  
 2   method of claim 18 wherein the forwarding liveness status  
 3   information further includes at least one of (i) ~~[[the~~  
 4   ~~integrity and correct operation of forwarding tables,~~  
 5   ~~(ii)]~~ the integrity and correct operation of switch  
 6   fabric, (ii ~~[[iii]]~~) the integrity and correct operation  
 7   of a forwarding lookup engine, (iii ~~[[iv]]~~) the integrity  
 8   and correct operation of a traffic scheduler, (iv ~~[[v]]~~)  
 9   the integrity and correct operation of a traffic  
 10   classifier, (v ~~[[vi]]~~) the integrity and correct  
 11   operation of buffers in the data plane, (vi ~~[[vii]]~~) the  
 12   integrity and correct operation of packet segmentation

13 modules, (vii [~~viii~~]) the integrity and correct  
14 operation of packet reassembly modules, (viii [~~ix~~]) the  
15 integrity and correct operation of packet re-sequencing  
16 modules, (ix [~~x~~]) whether or not a node is restarting,  
17 (x [~~xi~~]) whether or not the forwarding plane is  
18 congested, or (xi [~~xii~~]) the integrity and correct  
19 operation of fragmentation modules.

1 Claim 22 (previously presented): The  
2 computer-implemented method of claim 18 wherein the  
3 forwarding liveness status information includes at least  
4 one of (i) bit error rate at a link interface, and (ii)  
5 clock synchronization at a link interface.

Claims 23-28 (canceled)

1 Claim 29 (currently amended): For use with a node,  
2 apparatus comprising:  
3 a) one or more processors;  
4 b) at least one input device; and  
5 c) one or more storage devices storing  
6 processor-executable instructions which, when  
7 executed by one or more processors, perform a method  
8 of:  
9 i) accepting forwarding liveness status  
10 information of at least two different  
11 interfaces;  
12 ii) composing an aggregated message including  
13 at least two indicators, each indicator  
14 identifying a different one of the at least two  
15 different interfaces of the node and the  
16 corresponding forwarding liveness status



17 information of the at least two different  
18 interfaces as data within the aggregated  
19 message; and  
20 iii) sending the aggregated message towards a  
21 neighbor node,  
22 wherein the forwarding liveness status  
23 information includes an integrity and correct  
24 operation of a forwarding table of the node.

1 Claim 30 (previously presented): The apparatus of claim  
2 29 further comprising:  
3 iv) maintaining a first timer for tracking a  
4 send time interval, wherein the act of  
5 composing the aggregated message and sending  
6 the aggregated message compose and send the  
7 aggregated message after expiration of the  
8 first timer; and  
9 v) restarting the first timer after the  
10 aggregated message is sent.

1 Claim 31 (previously presented): The apparatus of claim  
2 30 wherein the aggregated message further includes a dead  
3 time interval, and wherein the send time interval is less  
4 than the dead time interval.

1 Claim 32 (previously presented): The apparatus of claim  
2 30 wherein the aggregated message further includes a dead  
3 time interval, and wherein the send time interval is no  
4 more than one third of the dead time interval.

1 Claim 33 (previously presented): The apparatus of claim  
2 30 wherein the send time interval is less than one  
3 second.

1 Claim 34 (previously presented): The apparatus of claim  
2 30 wherein the send time interval is less than 100 msec.

1 Claim 35 (previously presented): The apparatus of claim  
2 29 wherein the aggregated message further includes a dead  
3 time interval.

1 Claim 36 (previously presented): The apparatus of claim  
2 29 wherein the act of sending the aggregated message  
3 includes providing the aggregated message in an Internet  
4 protocol packet.

1 Claim 37 (previously presented): The apparatus of claim  
2 36 wherein the act of sending the aggregated message  
3 includes setting a destination address in the Internet  
4 protocol packet to a multicast address associated with  
5 routers that support interface forwarding liveness.

1 Claim 38 (previously presented): The apparatus of claim  
2 29 wherein the status information includes a forwarding  
3 liveness state selected from a group of forwarding  
4 liveness states consisting of (A) interface up, B)  
5 interface down, (C) interface monitor not reporting, and  
6 (D) forwarding engine restarting.

1 Claim 39 (currently amended): For use with a node,  
2 apparatus comprising:  
3 a) one or more processors;

4       b) at least one input device; and  
5       c) one or more storage devices storing  
6       processor-executable instructions which, when  
7       executed by one or more processors, perform a method  
8       of:

9           i) receiving an aggregated message including  
10            A) at least two indicators, each  
11            indicator identifying a different one of  
12            at least two different interfaces of a  
13            neighbor node and corresponding forwarding  
14            liveness status information for the ~~[[a~~  
15            ~~first set of]]~~ at least two different  
16            interfaces as data within the aggregated  
17            message, and  
18            B) a time interval; and  
19           ii) updating neighbor node forwarding liveness  
20            status information using the aggregated  
21            message,  
22            wherein the forwarding liveness status  
23            information includes an integrity and correct  
24            operation of a forwarding table of the neighbor  
25            node.

1   Claim 40 (currently amended): The apparatus of claim 39  
2   wherein the act of updating neighbor node liveness status  
3   information includes

4           A) setting a first timer to the time  
5           interval and starting the first timer,  
6           B) setting a status of each of the at  
7           least two different interfaces of the  
8           neighbor node to down if the first timer  
9           expires; and

10 C) if a further message, sourced from the  
11 neighbor node, and including  
12 1) at least two indicators, each  
13 indicator identifying a different one  
14 of the at least two different  
15 interfaces and corresponding  
16 forwarding liveness status  
17 information, and  
18 2) a new time interval,  
19 is received, resetting the first timer to  
20 the new time interval and restarting the  
21 first timer.

1 Claim 41 (previously presented): The apparatus of claim  
2 39 wherein each of the time interval and the new time  
3 interval is less than one second.

1 Claim 42 (previously presented): The apparatus of claim  
2 39 wherein the forwarding liveness status information is  
3 interface forwarding liveness status information.

1 Claim 43 (previously presented): The apparatus of claim  
2 39 wherein the status information includes a forwarding  
3 liveness state selected from a group of forwarding  
4 liveness states consisting of (A) interface up, (3)  
5 interface down, (C) interface monitor not reporting, and  
6 (D) forwarding engine restarting.

1 Claim 44 (currently amended): The apparatus of claim 39  
2 wherein the forwarding liveness status information  
3 further includes at least one of (i) ~~[[the integrity and~~  
4 ~~correct operation of forwarding tables, (ii)]]~~ the

5 integrity and correct operation of switch fabric, (ii  
 6 [[iii]]) the integrity and correct operation of a  
 7 forwarding lookup engine, (iii [[iv]]) the integrity and  
 8 correct operation of a traffic scheduler, (iv [[v]]) the  
 9 integrity and correct operation of a traffic classifier,  
 10 (v [[vi]]) the integrity and correct operation of buffers  
 11 in the data plane, (vi [[vii]]) the integrity and correct  
 12 operation of packet segmentation modules, (vii [[viii]])  
 13 the integrity and correct operation of packet reassembly  
 14 modules, (viii [[ix]]) the integrity and correct  
 15 operation of packet re-sequencing modules, (ix [[x]])  
 16 whether or not a node is restarting, (x [[xi]]) whether  
 17 or not the forwarding plane is congested, or (xi [[xii]])  
 18 the integrity and correct operation of fragmentation  
 19 modules.

1 Claim 45 (previously presented): The apparatus of claim  
 2 39 wherein the forwarding liveness status information  
 3 includes at least one of (i) bit error rate at a link  
 4 interface, and (ii) clock synchronization at a link  
 5 interface.

1 Claim 46 (currently amended): A system comprising:  
 2 a) a first node including  
 3 i) one or more processors;  
 4 ii) at least one input device; and  
 5 iii) one or more storage devices storing  
 6 processor-executable instructions which when  
 7 executed by one or more processors, perform a  
 8 method of:

9 A) determining, at a first node,  
10 forwarding liveness status information for  
11 at least two different interfaces, and  
12 B) sending an aggregated message  
13 including at least two indicators, each  
14 indicator identifying a different one of  
15 the at least two different interfaces of  
16 the first node and the corresponding  
17 determined status information for the at  
18 least two different interfaces as data  
19 within the aggregated message,  
20 wherein the forwarding liveness  
21 status information includes an integrity  
22 and correct operation of a forwarding  
23 table of the first node; and  
24 b) a second node including  
25 i) one or more processors;  
26 ii) at least one input device; and  
27 iii) one or more storage devices storing  
28 processor-executable instructions which when  
29 executed by one or more processors, perform a  
30 method of:  
31 A) receiving the aggregated message, and  
32 B) updating first node forwarding liveness  
33 status information using the aggregated  
34 message.

1 Claim 47 (previously presented): The system of claim 46  
2 wherein the aggregated message further includes a dead  
3 interval, and wherein the act of updating first node  
4 forwarding liveness status information includes  
5 i) setting a timer to the dead interval;

6           ii) starting the timer;  
 7           iii) determining whether or not a further  
 8           message including forwarding liveness status  
 9           information is received from the first node  
 10          before the expiration of the timer; and  
 11          iv) informing the second node that the at  
 12          least two different interfaces of the first  
 13          node are down if it is determined that a  
 14          further message including forwarding liveness  
 15          status information is not received from the  
 16          first node by the second node before the  
 17          expiration of the timer.

1   Claim 48 (previously presented): The system of claim 46  
 2   wherein the status information includes a forwarding  
 3   liveness state selected from a group of forwarding  
 4   liveness states consisting of (A) interface up, (B)  
 5   interface down, (C) interface monitor not reporting, and  
 6   (D) forwarding engine restarting.

1   Claim 49 (currently amended): The system of claim 46  
 2   wherein the forwarding liveness status information  
 3   further includes at least one of (i) ~~[[the integrity and~~  
 4   ~~correct operation of forwarding tables, (ii)]]~~ the  
 5   integrity and correct operation of switch fabric, (ii  
 6   ~~[[iii]]~~) the integrity and correct operation of a  
 7   forwarding lookup engine, (iii ~~[[iv]]~~) the integrity and  
 8   correct operation of a traffic scheduler, (iv ~~[[v]]~~) the  
 9   integrity and correct operation of a traffic classifier,  
 10   (v ~~[[vi]]~~) the integrity and correct operation of buffers  
 11   in the data plane, (vi ~~[[vii]]~~) the integrity and correct  
 12   operation of packet segmentation modules, (vii ~~[[viii]]~~)

13 the integrity and correct operation of packet reassembly  
14 modules, (viii ~~[[i\*]]~~) the integrity and correct  
15 operation of packet re-sequencing modules, (ix ~~[[\*]]~~)  
16 whether or not a node is restarting, (x ~~[[\*i]]~~) whether  
17 or not the forwarding plane is congested, or (xi ~~[[\*i]]~~)  
18 the integrity and correct operation of fragmentation  
19 modules.

1 Claim 50 (original): The system of claim 46 wherein the  
2 forwarding liveness status information includes at least  
3 one of (i) bit error rate at a link interface, and (ii)  
4 clock synchronization at a link interface.

1 Claim 51 (previously presented): The  
2 computer-implemented method of claim 1 wherein the  
3 forwarding liveness status information of at least one of  
4 the at least two different interfaces included in the  
5 aggregated message includes a forwarding liveness state  
6 set to interface monitor not reporting.

1 Claim 52 (previously presented): The  
2 computer-implemented method of claim 1 wherein the  
3 forwarding liveness status information of at least one of  
4 the at least two different interfaces included in the  
5 aggregated message includes a forwarding liveness state  
6 set to forwarding engine restarting.

1 Claim 53 (currently amended): The computer-implemented  
2 method of claim ~~[[12]]~~ 11 wherein the forwarding  
3 liveness status information of at least one of the at  
4 least two different interfaces included in the first set  
5 of at least two different interfaces included within the



6 aggregated message includes a forwarding liveness state  
7 set to interface monitor not reporting.

1 Claim 54 (currently amended): The computer-implemented  
2 method of claim ~~[[12]]~~ 11 wherein the forwarding liveness  
3 status information of at least one of the at least two  
4 different interfaces included in the first set or at  
5 least two different interfaces included within the  
6 aggregated message includes a forwarding liveness state  
7 set to forwarding engine restarting.